

CLAIMS

What is claimed is:

1. A system for controlling and manipulating solidification of a molten material, the system comprising:
 - 5 a substrate on which the molten material is deposited; and
 - a writing system that imposes a gradient pattern on at least a portion of the substrate on which the molten material is deposited.
- 10 2. The system as set forth in claim 1 further comprising an erasing system positioned to substantially erase the gradient pattern imposed on the substrate.
- 15 3. The system as set forth in claim 1 where in the gradient pattern is a thermal gradient pattern.
4. The system as set forth in claim 1 where in the gradient pattern is a compositional gradient pattern.
- 20 5. The system as set forth in claim 1 wherein the writing system comprises a laser that generates a light signal used to impose a gradient pattern on the substrate.
- 25 6. The system as set forth in claim 5 wherein the writing system further comprises a prism which reflects the light signal from the laser on to the substrate.
7. The system as set forth in claim 1 further comprising a drive system connected to the substrate.
- 30 8. The system as set forth in claim 7 wherein the substrate is a wheel.

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9. The system as set forth in claim 7 wherein the substrate is a belt.

10. The system as set forth in claim 7 wherein the substrate is a product that is being coated with the molten material.

11. The system as set forth in claim 1 further comprising a source for the molten material that deposits the molten material on at least a portion of the gradient pattern formed on the substrate.

12. The system as set forth in claim 11 wherein the source for the molten material comprises:

- a container for the molten material;
- a nozzle having a passage connected to the container and positioned adjacent to and spaced from the substrate to deposit the molten material on at least a portion of the gradient pattern formed on the substrate; and
- a pressure system that applies pressure to the molten material being dispensed from the nozzle on to the substrate.

13. A method for controlling and manipulating solidification of a molten material, the method comprising:

- generating a gradient pattern on at least a portion of a substrate; and
- depositing the molten material on at least a portion of the substrate with the gradient pattern.

14. The method as set forth in claim 13 further comprising substantially erasing the gradient pattern imposed on the substrate after the depositing.

15. The method as set forth in claim 13 where in the gradient pattern is a thermal gradient pattern.

16. The system as set forth in claim 13 where in the gradient pattern is a compositional gradient pattern.

17. The method as set forth in claim 13 wherein the generating
5 comprises directing a light signal from a laser on the substrate to impose the gradient pattern.

18. The method as set forth in claim 17 wherein the generating
10 further comprises reflecting the laser light signal on to the substrate.

19. The method as set forth in claim 13 further comprising
rotating the substrate.

20. The method as set forth in claim 19 wherein the substrate is
15 a wheel.

21. The method as set forth in claim 19 wherein the substrate is
a belt.

22. The method as set forth in claim 19 wherein the substrate is
20 a product that is being coated with the molten material.

23. The method according to claim 13 wherein the depositing
further comprises applying pressure to the molten material being dispensed.

24. A system for continuous casting of a molten material, the
25 system comprising:

a source for the molten material;

a substrate on which the molten material is deposited;

a driving system that rotates the substrate; and

30 a writing system that imposes a gradient pattern on at least a portion of the substrate on which the molten material is deposited by the source.

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25. The system as set forth in claim 24 further comprising an erasing system positioned to substantially erase the gradient pattern imposed on the substrate.

5 26. The system as set forth in claim 24 where in the gradient pattern is a thermal gradient pattern.

27. The system as set forth in claim 24 where in the gradient pattern is a compositional gradient pattern.

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28. The system as set forth in claim 24 wherein the writing system comprises a laser that generates a light signal used to impose the gradient pattern on the substrate.

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29. The system as set forth in claim 24 wherein the writing system further comprises a prism which reflects the light signal from the laser on to the substrate.

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30. The system as set forth in claim 24 wherein the substrate is a wheel.

31. The system as set forth in claim 24 wherein the substrate is a belt.

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32. The system as set forth in claim 24 wherein the source for the molten material comprises:

a container for the molten material;

a nozzle having a passage connected to the container and positioned adjacent to and spaced from the substrate to deposit the molten material on at least a portion of the gradient pattern formed on the substrate; and

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a pressure system that applies pressure to the molten material being dispensed from the nozzle on to the substrate.

33. A method for continuous casting of a molten material, the method comprising:

rotating a substrate;

generating a gradient pattern on at least a portion of the

5 substrate; and

depositing the molten material on at least a portion of the substrate with the gradient pattern.

34. The method as set forth in claim 33 further comprising
10 substantially erasing the gradient pattern imposed on the substrate after the depositing.

35. The system as set forth in claim 33 where in the gradient pattern is a thermal gradient pattern.

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36. The system as set forth in claim 33 where in the gradient pattern is a compositional gradient pattern.

37. The method as set forth in claim 33 wherein the generating
20 comprises directing a light signal from a laser on the substrate to impose the gradient pattern.

38. The method as set forth in claim 37 wherein the generating further comprises reflecting the laser light signal on to the substrate.

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39. The method as set forth in claim 33 wherein the substrate is a wheel.

40. The method as set forth in claim 33 wherein the substrate is
30 a belt.

41. The method according to claim 33 wherein the depositing further comprises applying pressure to the molten material being dispensed.

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